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**ACOUSTICAL ANALYSIS REPORT**

**FOR**

**MOUNTAIN VIEW IV 49 MW WIND ENERGY PROJECT**

**SECTIONS 27 AND 28, T. 3 S., R. 4 E.**

**PALM SPRINGS, CALIFORNIA**

2005 November 8

Prepared For

Mountain View Power Partners IV, LLC  
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Prepared By

A handwritten signature in black ink that reads "Bruce Walker". The signature is fluid and cursive, with the first name "Bruce" and last name "Walker" clearly distinguishable.

Bruce Walker, Ph.D., INCE Board Certified

## INTRODUCTION AND SUMMARY

Mountain View Power Partners IV, LLC proposes to install a 49 MW wind power project on Sections 27 and 28, T. 3 S., R. 4 E.. The project will consist of either 49 ea 1 MW Mitsubishi Heavy Industries (MHI) or 58 ea. 850 kW Gamesa Eolica wind turbines, arranged in five rows. The project applicant has requested that an acoustical analysis be conducted to ensure that the project will comply with Palm Springs Noise Ordinance 11.74.044 at all noise sensitive uses surrounding the project.

The Palm Springs Noise Ordinance establishes a wind energy noise limit of 55 dB (50 dB for noises with pure tone components) at residences and other noise sensitive uses. The nearest noise sensitive uses are new homes and a park, located approximately 3000 ft southerly of the project. Project-generated noise levels at these locations and others further distant to the southwest and southeast, computed using turbine noise emission levels as determined using IEC standard measurement procedures, are below 45 dB and exhibit no pure tone components as defined by the Ordinance. The project therefore complies with the Palm Springs Noise Ordinance.

## PROJECT DESCRIPTION

The project consists of five rows of wind turbines with a total of either 49 ea. 1MW wind turbines as shown in Figure 1 or 58 ea. 850 kW wind turbines as shown in Figure 2. Also shown in Figures 1 and 2 are the locations of the nearest noise sensitive uses in the project area. Note that the closest residence-to-turbine distance is approximately 900 meters (2950 ft).

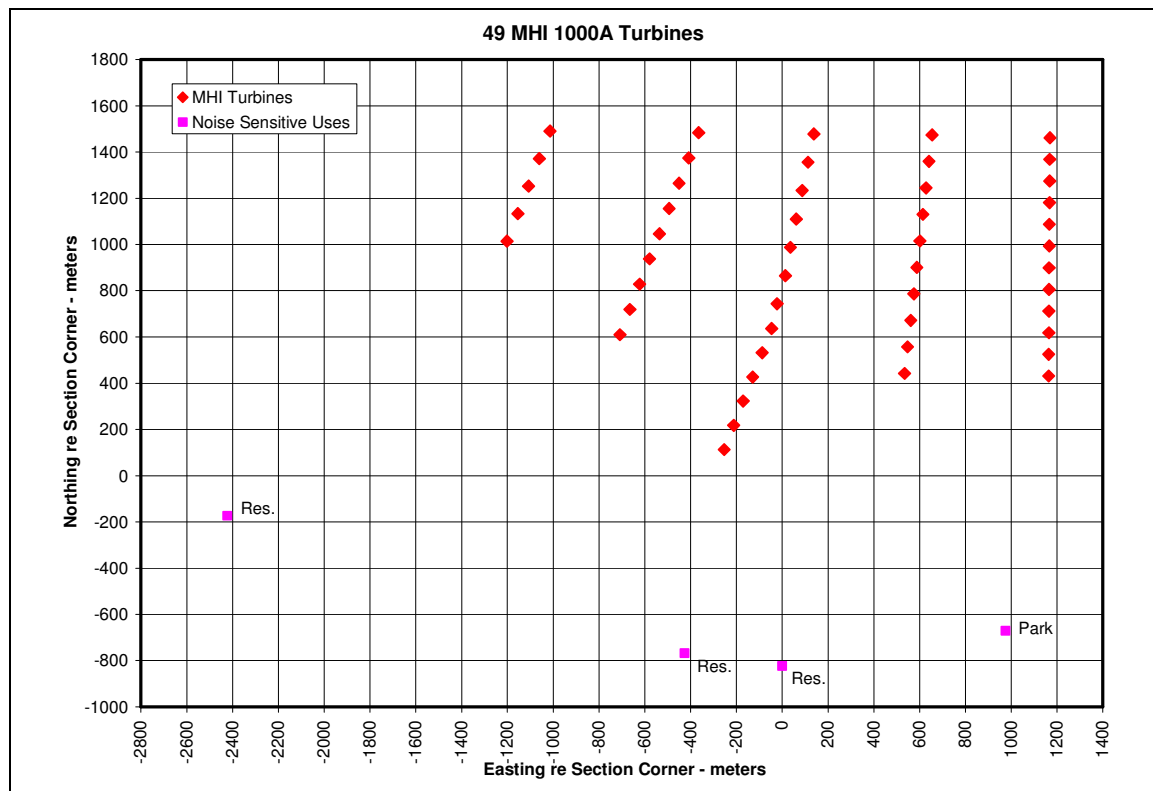
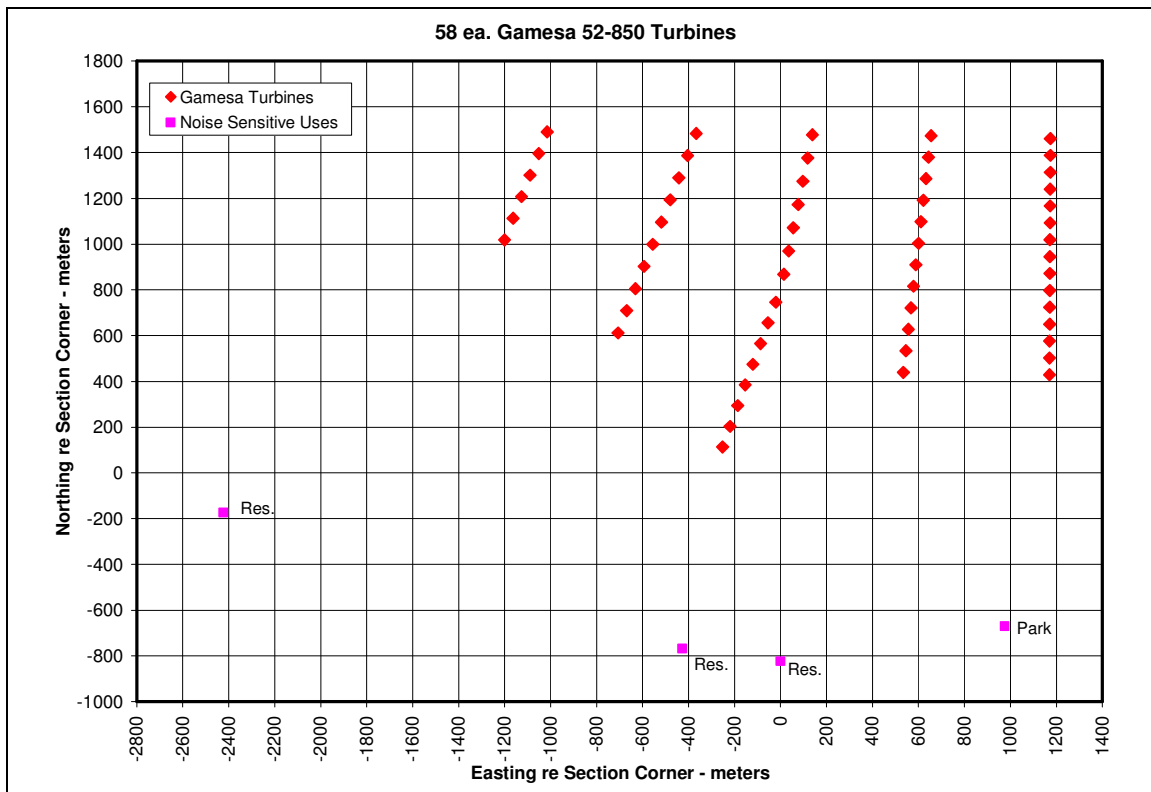


Figure 1. MHI 1000A Turbine Layout and Off-Site Noise Sensitive Uses



**Figure 2. Gamesa Eolica 52-850 Turbine Layout and Off-Site Noise Sensitive Uses**

Physical parameters of the two alternative turbine types are shown in Table 1.

**Table 1. Physical Parameters of Proposed Alternative Turbine Types**

Parameter	MHI 1000A	Gamesa Eolica 52-850
Hub Height:	55 meters	65 meters
Rotor Diameter:	61 meters	52 meters
Overall Height:	85.7 meters	91 meters
Rotor Location:	Upwind of Tower	Upwind of Tower
Rotor Blades:	Three	Three
Nominal Rotation Speed:	24 RPM	
Rated Output Power:	1000 kW	850 kW
Power Regulation:	Variable Speed and Pitch	Variable Speed and Pitch
Tower Type	Steel Tube	Steel Tube

Noise vs wind speed curves for the two turbines, as measured according to IEC 61400-11 are shown in Figure 3 and Figure 4. In summary, the Reference Noise Level (RNL, noise level at 400 ft at 90% power) for the Gamesa turbine is 52.5 dB based on the measurements. For the MHI turbine, the measured value of RNL would be 48.8 dB. However, the warranted standard noise emission level of the MHI turbine is higher than the reported measurements by approximately 3.5 dB, resulting in RNL 52.4 dB for purposes of project evaluation.<sup>1</sup>

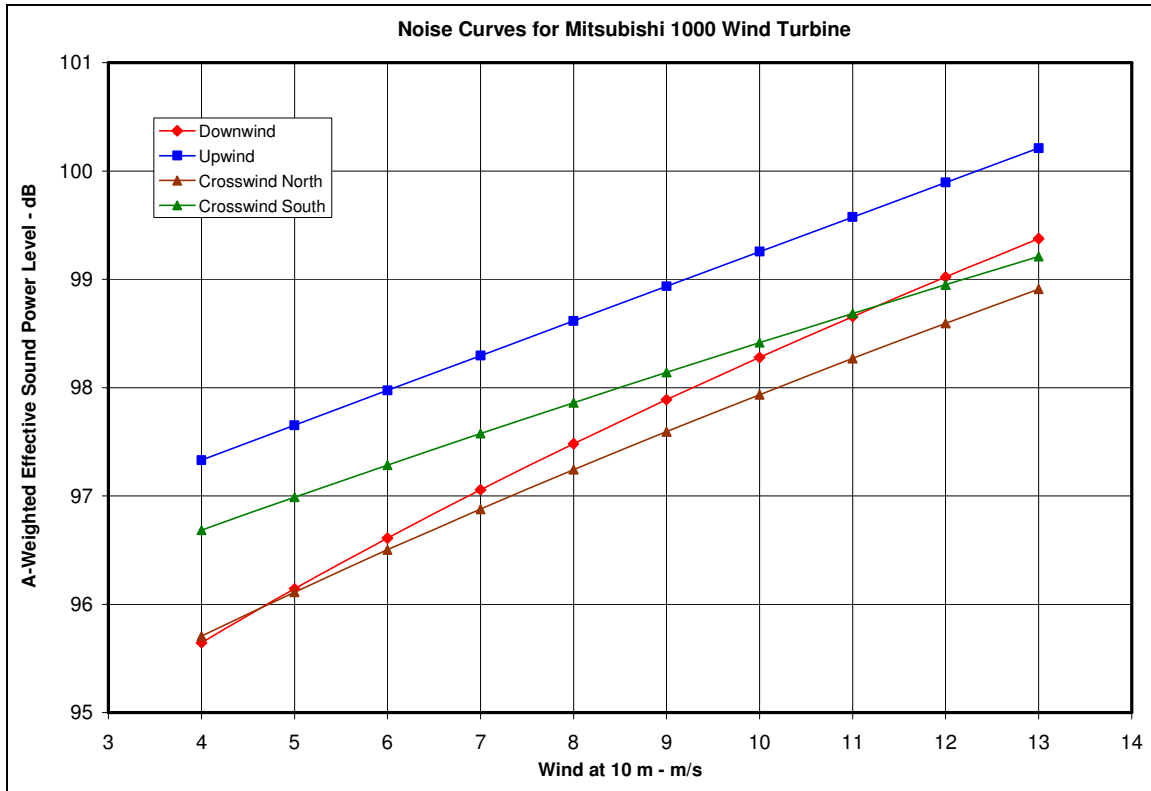


Figure 3. Measured Noise Emissions Curves for MHI 1000 Wind Turbine<sup>2</sup>

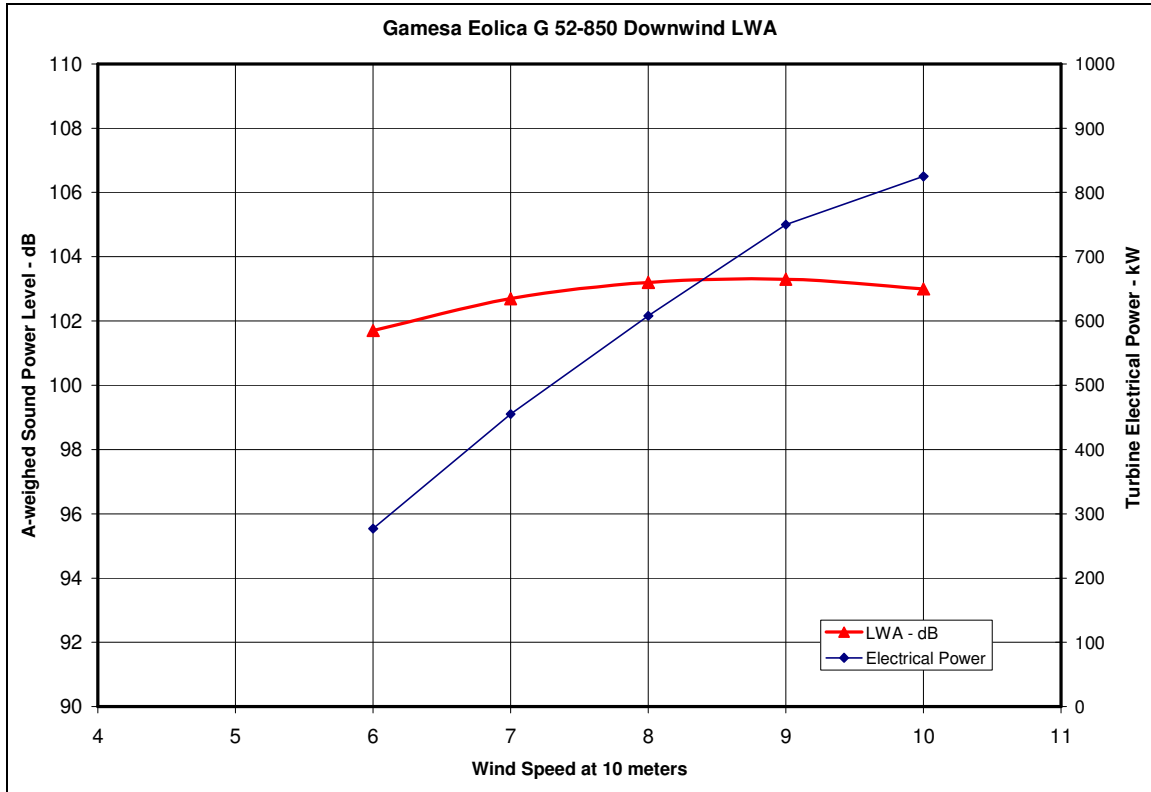


Figure 4. Measured Noise Emissions Curves for Gamesa Eolica 52-850 Wind Turbine<sup>3</sup>

One-third octave noise emissions spectra for the two alternative turbines are shown in Figure 5. It may be noted that both spectra are free of tones as defined by Palm Springs Ordinance 11.74.044(c)(2). The only distinct spectral protrusion is 6 dB for the Gamesa at 80 Hz, where the ordinance defines a tone as 15 dB protrusion for frequencies below or equal to 125 Hz.

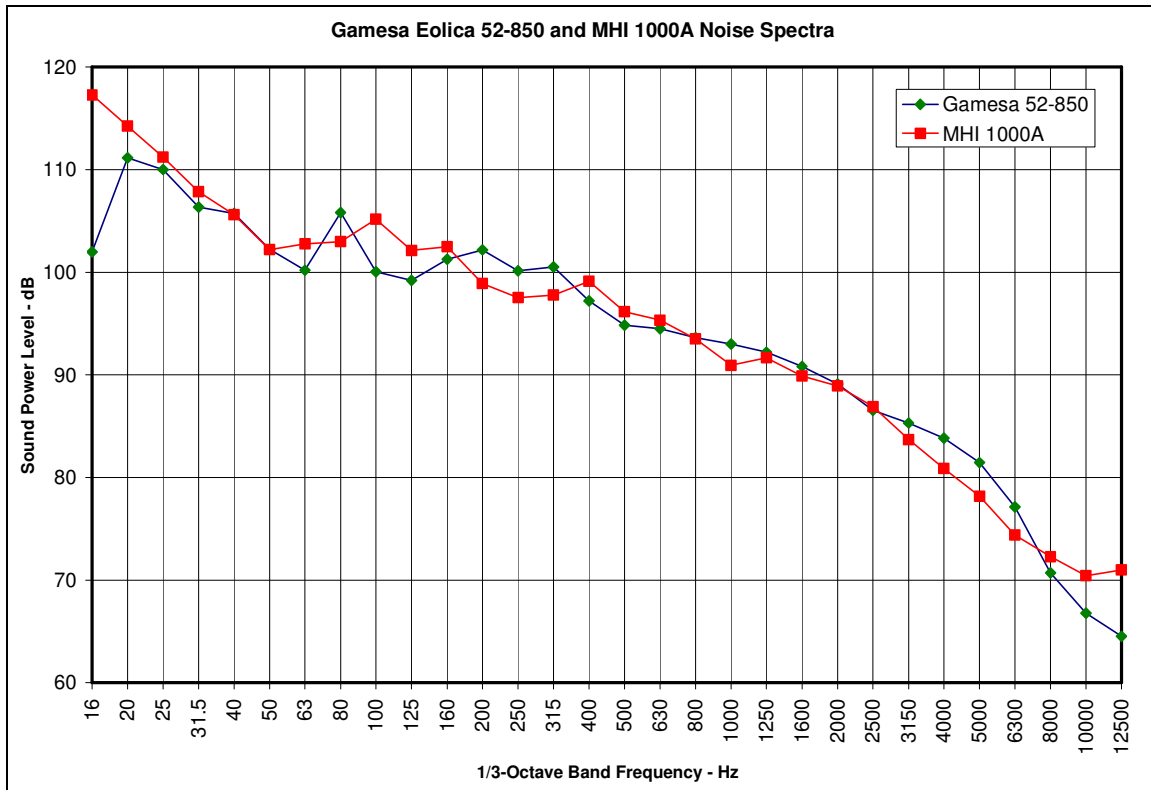
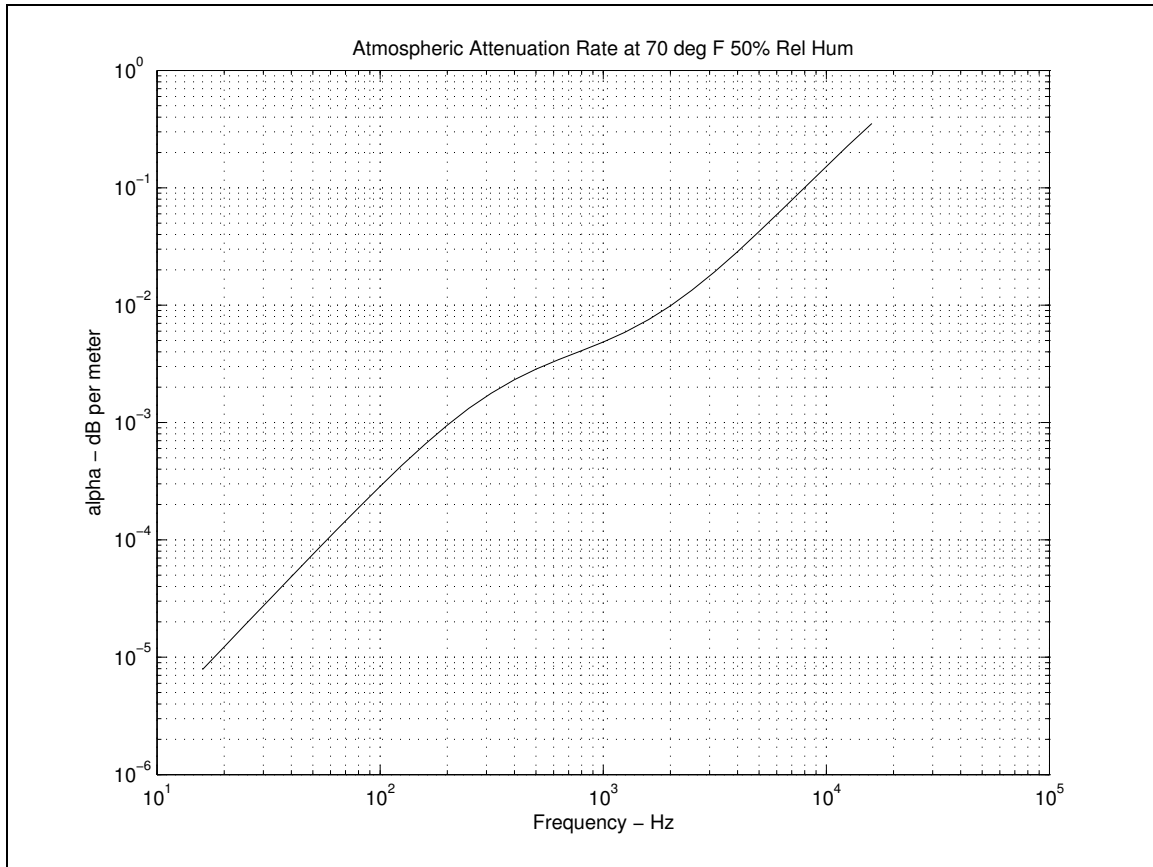


Figure 5. 1/3-Octave Noise Emissions Spectra for MHI and Gamesa Turbines<sup>2,3</sup>

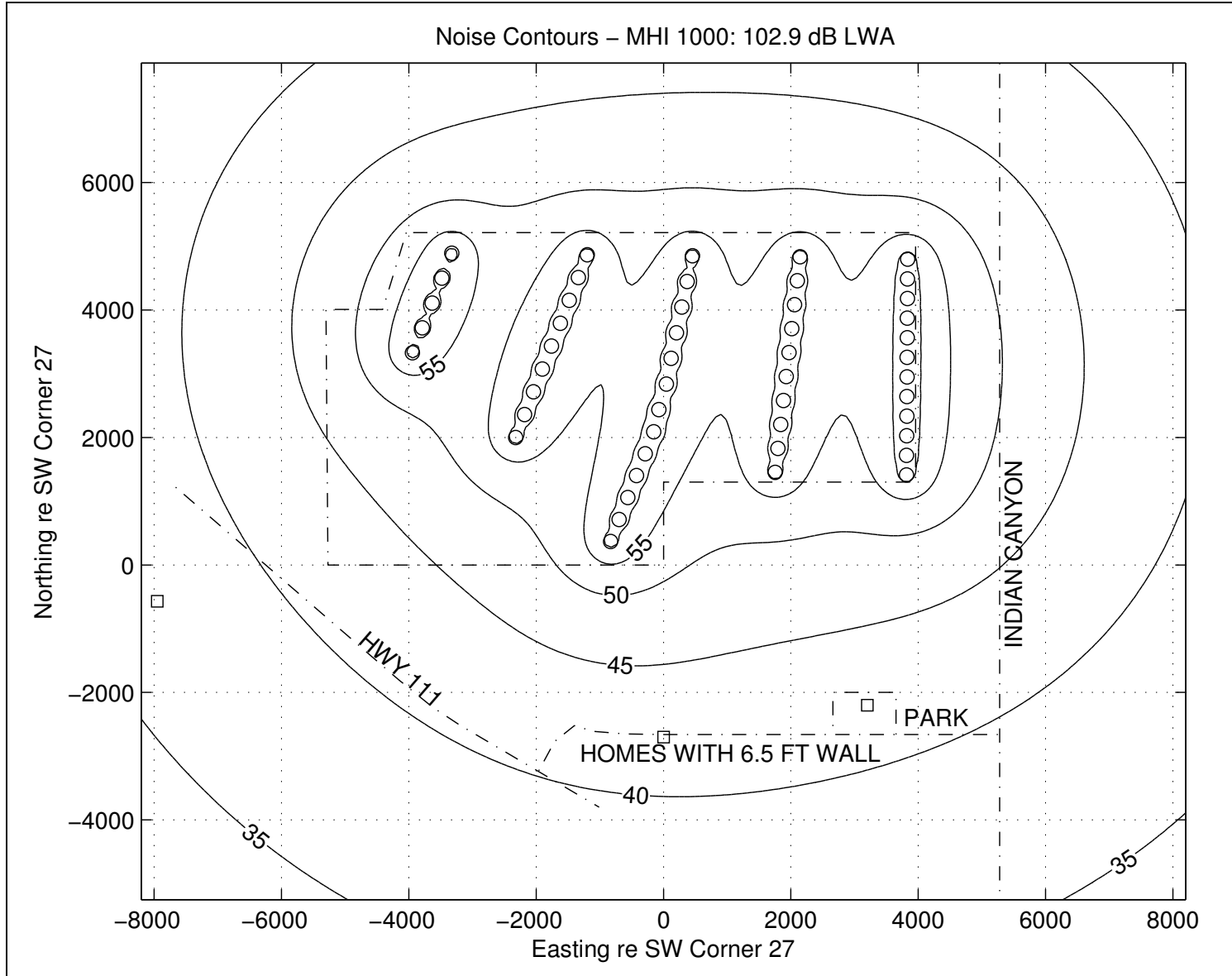
## OFF-SITE NOISE LEVEL COMPUTATIONS

Noise contours were computed on 5 dB increments around the project, using methodology dictated by Ordinance 11.74.044(g)(1) and (2). The atmospheric loss at 70 degrees, 50% humidity is shown in Figure 6. Note that at 500 Hz, the loss is approximately 3 dB per km, which is nearly the same as the 1 dB per 1000 ft factor often used to calculate noise contours from overall noise emission level LWA. However, the noise contours for this project were computed from the 1/3-octave spectra in Figure 5 using the loss factors from Figure 6.

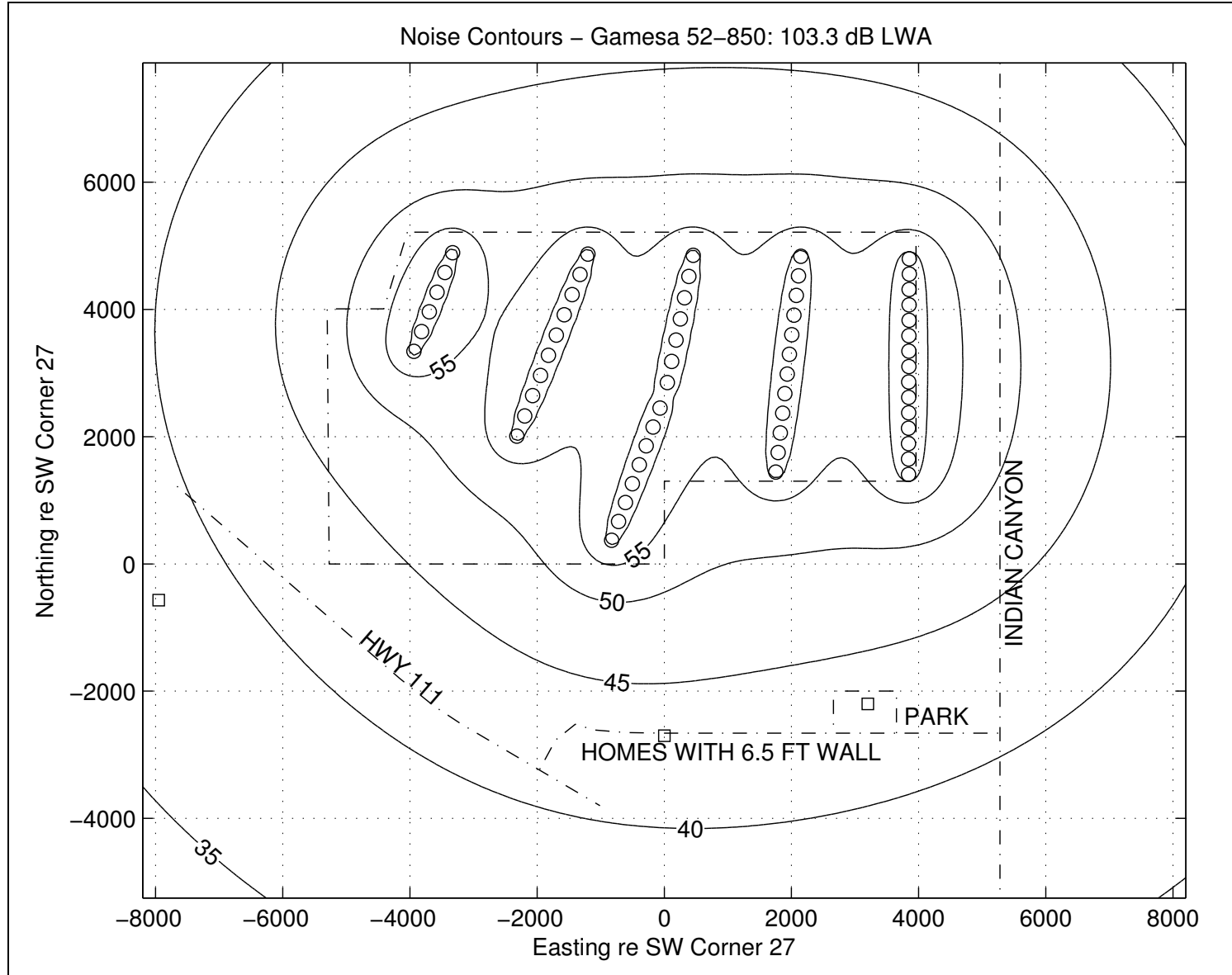


**Figure 6. Atmospheric Attenuation vs. Frequency at 70 deg. F, 50% R.H.**

To compute noise contours, receptor sites were set up on a 201 x 201 point grid encompassing the project and surrounding existing or projected noise sensitive uses. At each of the 40,401 grid points, PWNL was computed in accordance with 11.74.044(g)(1) and (2). The Matlab CONTOUR function was then used to compute and plot noise contours on 5 dB increments, as shown in Figure 7 and Figure 8. In addition, locations of turbines (small circles), closest noise sensitive uses (small squares) and area landmarks were overlaid on the maps and the coordinate system converted to feet for easy reference.



**Figure 7 MHI 1000 at Measured Noise Level 102.9 dB LWA**



**Figure 8. Gamesa 52-850 at Measured Noise Level 103.3 dB LWA**



Noise Levels at specific off-site locations are shown in Table 2. It can be seen that at each location the noise from the Gamesa Eolica turbine option is about 1 dB higher than the MHI option as the result of similar noise emission levels but approximately 20% more turbines. In either case, projected noise levels are substantially below the 55 dB criterion established by the City Ordinance.

**Table 2. Summary of Off-Site Noise Levels from Project**

Location	Easting	Northing	MHI 1000A	Gamesa 52-850
Residences West of Hwy. 111	-7950	-570	37.5	38.5
Residences Under Construction NE of Hwy. 111	-1400	-2520	42	43
New Residences South of Project	0	-2700	42	43
Park Southeast of Project	3200	-2200	42	43
SE Corner Indian and Tramview	5300	-2700	40	41

## CONCLUSION

Computed off-site noise levels from two project options demonstrate that wind turbine noise would be below 45 dB at noise-sensitive locations and therefore comply with the Palm Springs Noise Ordinance.

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<sup>1</sup> Note that presentation of noise measurements and computations to 0.1 dB precision is for purposes of illustration and should not be construed as an indication of accuracy. Typical calibration tolerance for acoustic measurement equipment is  $\pm 0.3$  dB and the minimum discernable difference in sound levels under field conditions is approximately  $\pm 1$  dB. Differences of  $\pm 3$  dB are generally considered to be clearly noticeable and  $\pm 10$  dB corresponds approximately to doubling or halving of subjective loudness judgment.

<sup>2</sup> ACOUSTIC MEASUREMENT REPORT FOR MITSUBISHI 1 MW WIND TURBINE #54, OASIS WIND DEVELOPMENT, MOJAVE, CALIFORNIA, 2005 June 21, Channel Islands Acoustics, 676 West Highland Drive, Camarillo, CA 93010, 805-484-8000, FAX 805-482-5075, bwalker@channelislandsacoustics.com

<sup>3</sup> Data Sheet de Ruido 103 dB según norma IEC 61400-11 para aerogenerador G52-850kW (inglés) IF009065.R00, Pamplona, 13 of January 2003, GAMESA EÓLICA S.A., Polígono de Agustinos, C/A S/N 31013 Pamplona Phone: +34 948 309010 Fax: +34 948 309009